

REMARKS

Summary of the Office Action

In the present Office Action, the Examiner has rejected Claims 1-20 over the art of record. By the present Remarks, Applicant submits that the rejections have been overcome, and respectfully requests reconsideration of the outstanding Office Action and allowance of the present application.

Traversal of Rejection Under 35 U.S.C. § 103(a)

Applicant traverses the rejection of Claims 1-20 under U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,402,318 to Otsuka et al. [hereinafter “OTSUKA”].

A Review of OTSUKA

As shown in FIGS. 6 to 12, in the resin mold semiconductor device 101, a semiconductor chip 102 is disposed in a region defined by one of the ends of the interposer 103 adjacent the side of chip 102. The chip 102 and interposer 103 are mounted on the central portion of the surface support 104 through an adhesive layer. As stated in the specification of OTSUKA, the distal ends of the interposers 103 face respective sides of the semiconductor chip 102. The interposer 103 appears to have a pair of recessed shoulders extending along each side thereof. The rear ends (or recessed shoulders) of the interposers 103 are connected to leads 105 extending radially in four directions, with the chip 102 being at the center. As shown in FIGS. 8 to 12, the interposer 103 includes a flat, sheet-like ground wire 107 which is bonded to the support plate 104 with an insulating adhesive 106 such as an

epoxy adhesive. Signal lines 109 are disposed on the ground line 107 through an insulating film 108 made of a glass fiber-reinforced resin or a polyimide tape. A flat, sheet-like power source line 110 is disposed on signal lines 109 through insulating film 108, and a protective film 115 is deposited on the power source line 110.

In re independent Claim 1 (and dependent Claims 2-10)

In regard to independent Claim 1, the Examiner submits that OTSUKA differs from the claimed invention by not showing a non-conductive barrier between the interposer and the die pad. The Examiner notes that OTSUKA teaches an adhesive layer formed between the interposer and a portion of the die pad. The Examiner then submits that it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a non-conductive layer between the interposer and the die pad for keeping the interposer and the die pad in place.

Applicant's independent Claim 1 recites, *inter alia*, the die pad being *embedded* within the interposer body such that the bottom surface of the die pad is exposed in and substantially flush with the bottom surface of the interposer body

Moreover, Applicant's independent Claim 1 recites, *inter alia*, a plurality of electrically conductive interposer leads *embedded* within the top surface of the interposer body

Additionally, Applicant's independent Claim 1 recites, *inter alia*, . . . each of the interposer leads defining a land.

On the other hand, the OTSUKA die pad 104 *is not* embedded within the OTSUKA interposer body 103 such that the bottom surface of the die pad 104 is exposed in and substantially flush with the bottom surface of the interposer body 103. Rather, the OTSUKA

interposer body 103 is adhered to the top surface of the OTSUKA die pad 104, and therefore it is not possible for the bottom surface of the die pad 104 to be substantially flush with the bottom surface of the OTSUKA interposer body 103.

It is further noted that the OTSUKA leads 107P, 109P are not embedded within the top surface of the OTSUKA interposer body 103. Instead, the OTSUKA leads 107P and 109P are disposed on the upper surface of the recessed shoulders formed on both ends of the OTSUKA interposer body 103 with insulating film 108. In particular, leads 107P are formed from the flat sheet-like ground wire 107 which is bonded to the upper surface of the recessed shoulders, not embedded within the top surface 115 of the OTSUKA interposer body 103. And similarly, the OTSUKA leads 109 are disposed on the upper surface of the recessed shoulders, not embedded within the top surface 115 of the OTSUKA interposer body 103. Finally, it is noted that OTSUKA leads 107P and 109P do not define a land.

Therefore, even if the manner in which the Examiner modifies OTSUKA is assumed to be proper (which the Applicant disputes), the invention recited in independent Claim 1 still does not result. I.e., a proper modification of OTSUKA still does not teach inter alia, . . . the die pad being embedded within the interposer body such that the bottom surface of the die pad is exposed in and substantially flush with the bottom surface of the interposer body . . . ; . . . a plurality of electrically conductive interposer leads embedded within the top surface of the interposer body . . . each of the leads defining a land, as is recited in Claim 1.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of independent Claim 1 under U.S.C. § 103(a) and indicate that this claim is allowable over the art of record.

Furthermore, Applicant submits that Claims 2-10 are allowable for the reason that these claims depend from allowable independent Claim 1 and because these claims recite additional features that further define the present invention.

In particular, Applicant submits that OTSUKA does not teach or suggest, *inter alia*, wherein each of the interposer leads includes a finger portion having a top surface which is exposed in and substantially flush with the top surface of the interposer body, as is recited in Claim 2; wherein the finger portion of each of the interposer leads has an interior terminal end which extends to the cavity and an exterior terminal end which extends beyond the outer peripheral edge of the interposer body, and each of the interposer leads further includes a protuberance which projects downwardly from the finger portion in close proximity to the exterior terminal end thereof, the protuberance being oriented outward of the outer peripheral edge of the interposer body and defining the land, as is recited in Claim 3; wherein the land of each of the interposer leads, the bottom surface of the die pad, and the bottom surface of the interposer body extend in generally co-planar relation to each other, as is recited in Claim 4; wherein the finger portion of each of the interposer leads has an interior terminal end which extends to the cavity and an exterior terminal end which extends beyond the outer peripheral edge of the interposer body, and each of the interposer leads includes a downset which is formed within the finger portion thereof in close proximity to the exterior terminal end, the downset being partially covered by the interposer body and defining the land which is exposed in the bottom surface of the interposer body, as is recited in Claim 5; wherein the land of each of the interposer leads, the bottom surface of the die pad, and the bottom surface of the interposer body extend in generally co-planar relation to each other, as is recited in Claim 6; wherein the interposer body includes an integral pedestal which is disposed on the top surface thereof and extends over portions of each of the interposer leads, as is recited in

Claim 7; the interposer further in combination with a plurality of package leads supported by at least one of the interposer body and the interposer leads, a semiconductor die attached to the top surface of the die pad and electrically connected to at least some of the interposer leads and the package leads, and a package body at least partially covering the semiconductor die, the interposer and the package leads such that at least portions of the package leads, the lands of the interposer leads and the bottom surface of the die pad are exposed in the package body, as is recited in Claim 8; wherein the lands and the bottom surface of the die pad are exposed in and substantially flush with a bottom surface of the package body, and portions of the package leads protrude from respective side surfaces of the package body, as is recited in Claim 9; and wherein the lands, the bottom surface of the die pad, and portions of the package leads are exposed in and substantially flush with a bottom surface of the package body, as is recited in Claim 10.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 2-10 under U.S.C. § 103(a) and indicate that these claims are allowable over the art of record.

In re independent Claim 11 (and dependent Claims 12-19)

In regard to independent Claim 11, the Examiner submits that OTSUKA differs from the claimed invention by not showing a layer of adhesive tape extending along the peripheral edge. The Examiner then submits that “it would have been obvious to one of ordinary skill in the art at the time the invention was made for a layer of adhesive tape extending along the peripheral edge because it provides an attachment of the die with other device”.

Applicant’s independent Claim 11 recites, *inter alia*, a layer of adhesive tape attached to the top surface of the die pad

Moreover, Applicant's independent Claim 11 recites, *inter alia*, a plurality of electrically conductive interposer leads attached to the adhesive tape

Additionally, Applicant's independent Claim 11 recites, *inter alia*, each of the interposer leads defining a land.

On the other hand, OTSUKA teaches attaching the interposer 103 to the top surface of the OTSUKA support plate 104, not a layer of adhesive tape. As the Examiner notes, the semiconductor chip 102 and the interposer 103 are mounted on the central portion of the surface of the support 104 through an adhesive layer (e.g., Ag paste or Au-Si eutectic alloy). Moreover, the OTSUKA leads 107P and 109P are attached to the interposer 103, not to a layer of adhesive tape. And again, it is noted that OTSUKA leads 107P and 109P do not define any land whatsoever.

Because OTSUKA does not teach or suggest, *inter alia*, a layer of adhesive tape attached to the top surface of the die pad . . . ; a plurality of electrically conductive interposer leads attached to the adhesive tape . . . each of the interposer leads defining a land, Applicant submits that no proper modification of OTSUKA can render unpatentable the combination of features recited in at least independent Claim 11. I.e., even if the manner in which the Examiner modifies OTSUKA is assumed to be proper (which the Applicant disputes), the invention recited in independent Claim 11 still does not result.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of independent Claim 11 under U.S.C. § 103(a) and indicate that this claim is allowable over the art of record.

Furthermore, Applicant submits that Claims 12-19 are allowable for the reason that these claims depend from allowable independent Claim 11 and because these claims recite additional features that further define the present invention.

In particular, Applicant submits that OTSUKA does not teach or suggest, *inter alia*, wherein each of the interposer leads includes a finger portion having a top surface which extends in spaced, generally parallel relation to the top surface of the die pad and is electrically isolated therefrom by the layer of adhesive tape, as is recited in Claim 12; wherein the finger portion of each of the interposer leads has an interior terminal end which extends to the cavity, and an exterior terminal end which extends beyond the peripheral edge of the die pad, and each of the interposer leads further includes a protuberance which projects downwardly from the finger portion in close proximity to the exterior terminal end thereof, the protuberance being oriented outward of the peripheral edge of the die pad and defining the land, as is recited in Claim 13; wherein the land and the bottom surface of the die pad extend in generally co-planar relation to each other, as is recited in Claim 14; wherein the finger portion of each of the interposer leads has an interior terminal end which extends to the cavity and an exterior terminal end which extends beyond the peripheral edge of the die pad, and each of the interposer leads includes a downset which is formed within the finger portion thereof in close proximity to the exterior terminal end, the downset defining the land, as is recited in Claim 15; wherein the land and the bottom surface of the die pad extend in generally co-planar relation to each other, as is recited in Claim 16; the interposer further in combination with a plurality of package leads supported by the interposer leads, a semiconductor die attached to the top surface of the die pad and electrically connected to at least some of the interposer leads and the package leads, and a packaged body at least partially covering the semiconductor die, the interposer and the package leads such that at least portions of the package leads, the lands of the interposer leads and the bottom surface of the die pad are exposed in the package body, as is recited in Claim 17; wherein the lands and the bottom surface of the die pad are exposed in and substantially flush with a bottom surface

of the package body, and portions of the package leads protrude from respective side surfaces of the package body, as is recited in Claim 18; and wherein the lands, the bottom surface of the die pad, and portions of the package leads are exposed in and substantially flush with a bottom surface of the package body, as is recited in Claim 19.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of dependent Claims 12-19 under U.S.C. § 103(a) and indicate that these claims are allowable over the art of record.

In re independent Claim 20

In regard to independent Claim 20, the Examiner submits that OTSUKA differs from the claimed invention by not showing a non-conductive barrier between interposer and the die pad. The Examiner notes that OTSUKA teaches an adhesive layer formed between the interposer and a portion of the die pad. The Examiner then submits that it would have been obvious to one of ordinary skill in the art at the time the invention was made to include a non-conductive layer between the interposer and the die pad for keeping the interposer and the die pad in place.

Applicant's independent Claim 20 recites, *inter alia*, . . . each of the interposer leads defining a land.

As noted previously, the OTSUKA leads 107P and 109P are devoid of any land feature. And, because OTSUKA does not teach or suggest, *inter alia*, . . . each of the interposer leads defining a land, Applicant submits that no proper modification of OTSUKA can render unpatentable the combination of features recited in independent Claim 20. *I.e., even if the manner in which the Examiner modifies OTSUKA is assumed to be proper*

(which the Applicant disputes), the invention recited in independent Claim 20 still does not result.

Accordingly, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of independent Claim 20 under U.S.C. § 103(a) and indicate that this claim is allowable over the art of record.

Application is Allowable

Applicant respectfully submits that each and every pending claim of the present application meets the requirements for patentability under 35 U.S.C. §§ 112, 102 and 103, and respectfully requests that the Examiner indicate the allowance of such claims.

CONCLUSION

In view of the foregoing, it is submitted that none of the references of record, considered alone or in any proper combination thereof, anticipate or render obvious the Applicant's invention as recited in Claims 1-20. The applied references of record have been discussed and distinguished, while significant claimed features of the present invention have been pointed out.

Accordingly, reconsideration of the outstanding Office Action and allowance of the present application and all the claims therein is respectfully requested and now believed to be appropriate.

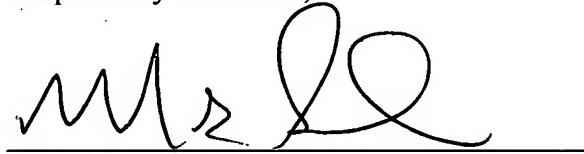
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